

ATP Molecule Modeling Lab by C. Kohn



Name: _____ Hour _____ Date: _____

Date Assignment is due: end of class Why late? _____ Score: + ☒ -
Day of Week Date If your project was late, describe why

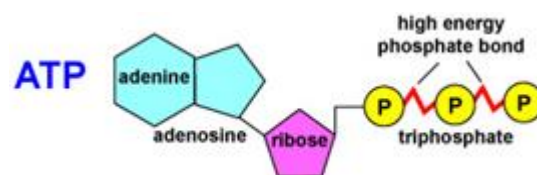
Objective: create the molecular structures of ATP, ADP, and ATP Synthase in order to understand how their structure relates to their function

Materials: Play-Doh, small Dixie cups, Solo cups, toothpicks

Directions: In this lab, you will be using the Play-doh to create the atomic structures of ATP, ADP, and ATP Synthase. To do so, you will need to create the following:

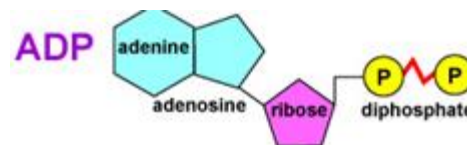
- **For ATP – for this model, create...**

- Three balls of the same color to represent phosphate molecules
- One pentagram-shaped ball of a different color to represent a ribose sugar
- One rectangle-shaped block of a third color to represent adenine
- Link all of these using a toothpick



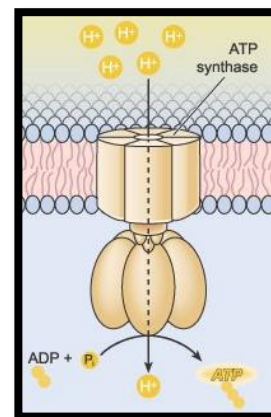
- **For ADP & P_i – for this model, create...**

- Two balls of the same color to represent phosphate molecules
- Create a third ball of this color for a lone inorganic phosphate (P_i)
- One pentagram-shaped ball of a different color to represent a ribose sugar
- One rectangle-shaped block of a third color to represent adenine
- Link all of these using a toothpick



- **For ATP Synthase – for this model...**

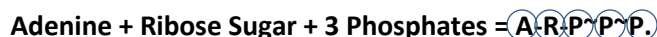
- Use the picture of an ATP Synthase macromolecule here to guide you
- Try to create something that resembles this using the Play-Doh, the cups, toothpicks, and other supplies at your disposal.
- Be sure to also include balls of Play-Doh to represent the hydrogen atoms.
- EXTRA CHALLENGE: if you have time, try to also make this a functional model that can add a phosphate to ADP to make ATP



Read carefully: Using the pictures of each molecule as a guide, create each molecule out of the Play-Doh atoms. Use the toothpicks to represent the bonds between each atom in the molecule. When you think you have successfully created both molecules, **raise your hand and show your instructor.** While you are waiting for approval and after receiving approval, complete the questions on the back. At the end of class, you may be asked to present your models or discuss the questions – prepare for this by discussing the questions with your team while working or after you have all finished.

Review: read, then answer the questions below

Adenosine triphosphate (ATP) is the most common energy-storing molecule in the cell. ATP is constructed from a molecule called adenine and a sugar called ribose (adenine and ribose are called adenosine). Adenosine triphosphate is called triphosphate because of the three phosphate molecules attached to the adenine and ribose.



Another molecule in the cell related to ATP is Adenosine diphosphate (ADP). ADP has two phosphate groups attached to it: A-R-P[~]P. When organisms need energy, they split the third phosphate group off from ATP to form ADP and a single phosphate.

Because of the high energy bonds between the phosphates, energy is released when the third phosphate is removed. This energy can be used to power most kinds of cellular activities, such muscle contraction, nerve signaling, etc. ADP and P_i can be combined back into ATP in a macromolecule called ATP Synthase.

Questions:

1. Which molecule can provide energy in order to power cellular activity?

2. Which molecule is the “dead battery” version and has had all of its potential energy depleted?

3. Which molecule “recharges” the ‘dead battery version’ into its charged, energy-carrying version?

4. Why did you include balls of hydrogen when you made ATP Synthase? What role does this hydrogen play?

5. What would happen if your ATP Synthase molecule didn’t have any hydrogen?

6. Where does this hydrogen for ATP Synthase come from?

7. What happens to the hydrogen after it has powered ATP Synthase?
